

Title

JHFNu (Phase I)

Physics Goals

Search for $\bar{\nu}_\mu$ to $\bar{\nu}_e$ oscillation that could lead to the first determination of the mixing angle θ_{13} with $\sin^2 \theta_{13}$ down to 0.006, measure mixing parameters Δm_{23}^2 to a precision of $1 \times 10^{-4} \text{ eV}^2$ and $\sin^2 \theta_{23}$ to 1%, explore CP violation in the lepton sector, study low-energy neutrino reactions with excellent precision, and search for neutrino magnetic moment.

Features

High-intensity off-axis narrow-band muon neutrino beam peaks around 0.8 GeV will be provided by JHF. The contamination of electron neutrino in the beam is expected to be about 0.2%. Two near detectors, one located at 280 m downstream of the pion production target and another one positioned at 1.8 km away, are used to study low-energy neutrino interactions and to determine the flux as well as the energy spectrum of the off-axis neutrino beam. Super-Kamiokande will be served as the far detector at a distance of 290 km from the target. The mixing angle is measured by observing the number of electron neutrinos appeared at the far detector, whereas angle θ_{23} will be precisely measured by the amount of disappearance of muon neutrino at Super-Kamiokande.

Technological Challenges

Design of a high-intensity low-loss proton beam line, a pion production target that can handle 1 MW of load, a horn for focusing pions, a fine-grained high-rate near detector at 280 m and a water Cerenkov detector at 2 km augmented with tracking stations that can separate quasi-elastic neutrino scattering from inelastic scattering processes (need to identify $\bar{\nu}_\mu$).

LBNL Contribution and Interest

Hardware: near detectors and readout electronics

Software: beam simulation, detector simulation, and analysis package

Expected or necessary LBNL Manpower: ?

Divisions involved: AFRD, Physics, and Nuclear Science (?)

Status

Preparing LOI and forming international collaboration.

Timeline

JHF is expected to deliver the neutrino beam by the end of 2006, experiment will begin in 2007.

LOI by Dec 31, 2002; proposal by Dec 31, 2003; detector construction in 2004-2006; installation of detector in 2006.

Duration of Experiment: 5 years of data taking.

Location

JHF at Tokai, and Super-Kamiokande at Kamioka, Japan.

Collaboration

Japanese institutions, and potential participation from Korean, Canadian, European, and U.S. institutions.

Funding Sources

Japanese government (~60%) and foreign contributions (~40%).

Resources, Links, and References

Websites: <http://neutrino.kek.jp/jhfnu/>

Preprint: hep-ex/0106019

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